REMARKS

Claims 1-18 are pending in this application. Claims 1, 5, 9, 10, 13, and 16 are independent claims. Claims 2-4, 6-8, 11, 12, 14, 15, 17, and 18 are dependent claims.

Claims 1-18 have been rejected. Amendments to claims 11, 12, 14, 15, 17, and 18 are presented herein. Claims 12, 15, and 18 have been rewritten in independent form. Claims 11, 14, and 17 have been amended to depend respectively from amended claims 12, 15, and 18. Claims 1-10, 13, and 16 have been cancelled in this response. The specification has been amended to improve form. No new matter is being presented, and approval and entry are respectfully requested.

Objection To The Title

In numbered paragraph 4 on page 2 of the Office Action, the Examiner objected to the title as not being descriptive. In view of the proposed amended title set forth above, Applicant requests withdrawal of the objection to the title.

Objection To The Abstract

In numbered paragraph 5 on pages 2 and 3 of the Office Action, the Examiner provided information regarding the proper content of an abstract. Changes have been made to the abstract only to place it in preferred and better U.S. form for issuance. No new matter has been added.

Changes To The Specification

Changes have been made to the specification only to place it in preferred and better U.S. form for issuance. No new matter has been added.

Objections to the Claims

In numbered paragraphs 6 and 7 on page 3 of the Office Action, the Examiner objected to claims 2, 6-8, 11, and 12 because of various informalities. Claims 2 and 6-8 have been cancelled in this response. Applicant submits that amendments to the claims presented above correct the informalities of claims 11 and 12. Accordingly, Applicant respectfully requests withdrawal of the objections to claims 11 and 12.

Rejections Under 35 U.S.C. § 102

In numbered paragraphs 8-24 on pages 3-7 of the Office Action, the Examiner rejected claims 1-18 under 35 U.S.C. § 102(e) as being anticipated by Shiell et al. (U.S. Patent No. 6,108,775). Applicant respectfully traverses these rejections for the reasons presented below.

Claim 12, which depended from claim 10, has been rewritten in independent form. Claim 12 recites an arithmetic and logic unit, including "a first part performing a branch prediction in response to a branch instruction; a second part updating a transition probability of the branch prediction according to whether a branch is actually made; a third part detecting that a process is switched; and a fourth part initializing branch prediction information when the third part detects that the process is switched, wherein **the fourth part performs initialization according to a branch destination of the branch instruction**" (emphasis added).

Shiell discloses initializing branch prediction information according to the type of program in which branching instructions are contained. To achieve this purpose, it may be necessary to prepare a number of prediction information tables that correspond to a number of programs. Accordingly, a considerably large circuit configuration may be needed, which may result in a total circuit size that is too large.

In contrast, initialization is fixedly performed in the present invention according to a branch destination address, without depending on a particular program. A specific value resulting from the initialization is determined according to a Backward Taken/Forward Not Taken (BTFN) method, as described on pages 18-20, for example, of the subject specification. According to the BTFN method, the probability of a branch being taken during program execution is approximately 70%. Thus, according to the present invention, a branch prediction

table should be updated according to a branch destination address and, thus, it can be expected that a prediction performed according to the updated prediction table would result in a hit immediately after a program is switched with a 70% probability, and it is possible to avoid degradation in prediction performance that would otherwise occur upon switching a process in terms of process running time, for example, immediately after process switching occurs.

In Shiell, prediction information is newly selected for each particular program. Thus, in Shiell, a prediction information table should be initialized using prediction information according to a particular program each time a process is switched. In this case, a prediction information value should be loaded and a branch prediction value should be set as many times as the number of entries in the prediction information table. Furthermore, if tables have been previously prepared to obtain these values, the circuit size would become large to store the tables, and, thus, the method of Shiell may not be advantageous in terms of hardware size of the microprocessor.

In contrast, according to the present invention, when a branch instruction is fetched, an initialization value for branch prediction is determined according to the BTFN method. Thus, a large number of tables for branch prediction that corresponds to respective programs is not needed.

Furthermore, the present invention avoids the degradation that would otherwise occur immediately after process switching. For example, in an operating system for multi-process execution, such as UNIX, upon switching in context (process switching), because a branch prediction table has not been sufficiently trained, many branch prediction errors may occur and, thus, progress in program execution may be slowed down, which may result in an increase in the time required for program execution. The present invention is directed to solving such a problem.

Thus, it is submitted that independent claim 12 patentably distinguishes over the prior art. Similar to claim 12, claims 15 and 18, which depended respectively from claims 13 and 16, have been rewritten in independent form. Claim 15 is directed to a branch prediction method, including "...wherein said initializing comprises performing initialization according to a branch destination of the branch instruction." Claim 18 is directed to an information processing apparatus, including "...wherein the fourth part performs initialization according to a branch

destination of the branch instruction." Thus, it is submitted that claims 15 and 18 patentably distinguish over the prior art for at least the reasons set forth above with respect to claim 12.

Claims 11, 14, and 17 depend respectively from claims 12, 15, and 18 and are patentable over the prior art for at least the reasons discussed above.

Therefore, Applicant submits that claims 11, 12, 14, 15, 17, and 18 patentably distinguish over the prior art. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections under § 102.

Conclusion

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted to be in condition for allowance, which action is earnestly solicited.

If there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

Finally, if there are any additional fees associated with filing of this response, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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